City of Cambridge

PURCHASING DEPARTMENT

795 Massachusetts Ave. • Cambridge, Massachusetts 02139-3219

Amy L. Witts
Purchasing Agent

To: **All bidders**

From: **City of Cambridge**

Date: **September 24, 2014**

Re: **File No 6576- Water Meters, Registers and other hardware Addendum No. 1**

The following question was submitted an answered.

Question
Will Cambridge accept Master Meter "Octave" Ultrasonic Meter" for larger meters? See specifications attached.

Answer
Yes

All other details remain the same.

Amy L. Witts

AMY L. WITTS
PURCHASING AGENT

ADDENDUM NO. 1

SPECIFICATION

Category: Cold Water Meter

Type: Ultrasonic Transit-Time

Size: 2" – 10"

Applicable AWWA Standard: C750

Master Meter, Inc. 101 Regency Parkway, Mansfield, TX 76063 T: 817-842-8000 F: 817-842-8100

1. GENERAL

Except as otherwise modified or supplemented herein, the latest revision of AWWA Standard C750 Transit-Time Flowmeters shall provide theory and operation specifics on the basic ultrasonic concept. This document will govern the materials, design, manufacture and testing of all meters furnished under this specification or equal as approved by the Director or his appointed agent.

AWWA Standard C750 is considered by the [Click here and type Name of Utility] to be only the minimum requirements and shall be supplemented herein to ensure the quality required by the utilities department.

Meters shall be manufactured by a company with a minimum of ten (10) years experience in manufacturing *various types* of cold water meters such as Multi-jet, Positive Displacement, Compound and Turbine Type water meters. The Manufacturer's corporate home office shall be in the United States.

Meters shall be bid without strainers and without companion flanges.

The water utilities department reserves the right to request a sample meter of a small size to study prior to awarding bids.

2. METER MAIN CASE

Outer cases shall be made of a cast ductile iron alloy equaling or exceeding AWWA Standards such as those listed in ASTM A536 or ASTM A126. The maincase shall be protected by a complete fusion-bonded coating conforming to AWWA C-550.

All external bolts and nuts shall be made of bronze or stainless steel, and shall be so designed for easy removal after having been in service for a long period of time.

The main case shall withstand a working pressure of 175 PSI without leakage, seepage in the castings, or distortion affecting the free and accurate operation of the measuring unit.

The size of the meter and the direction of flow shall be case in raised letters on the outer surface of the case.

3. REGISTER COVER

The register box shall be made of an engineering plastic with the manufacturer's serial number inside the register lid. Serial number of the meter shall also be permanently programmed in the electronic register.

Register cover box shall be attached to main case in a tamper resistant manner. The register cover box shall be equipped with a hinged lid that will overlap the register to protect the reading area.

4. REGISTER

The factory sealed register shall be electronically driven only and shall be furnished with a low flow leak detection symbol and with a reverse flow notification symbol. The register shall be identical within a given size or model subject to the programming of appropriate flow factors for the particular meter. An effectively tamper proof meter with a displayed tamper indication symbol, is required. The register shall be programmed initially to read in US. Gallons or Cubic Feet as ordered by the [Click **here** and type Name of Utility]. The transparent LCD register glass lens shall be made of molded heat-treated 0.25" glass to ensure against scratching and breakage. Serial number shall be permanently programmed in the electronic register.

As defined in these specifications, a "factory sealed" register shall mean a non-fogging, moisture and dust-proof register, electronically driven by the measuring section transit time sensors. Appearance of any fogging or moisture inside the register within the warranty period shall constitute component failure and will require a factory replacement. Register shall indicate reverse flow, rate of flow, low battery indication, leak alert, as well as no flow condition.

5. MEASURING SECTION

The measuring section shall be a unitized unit, completely integral to the meter body. The measuring section shall not include any moving parts and the measuring section shall have an unobstructed flow passage area at least equal to 50% of the nominal Schedule 40 pipe size corresponding to the meter's size.

All parts of the measuring section shall be similar with assemblies of the same size and material.

The measuring section shall be secured in a position in the main case in such a manner that slight distortion of the outer meter case will not affect the sensitivity or registration of the meter.

To ensure longevity of service, the performance of the measuring chamber shall be guaranteed to meet required Compound meter accuracy standards of AWWA M6 Manual for a period of two years from date of manufacturer's shipment.

The measuring section shall be covered for this period by written warranty as required or mentioned elsewhere in these specifications.

6. SIGNAL PROCESSING

Two pairs of sensors are to be mounted in the chordal direct configuration in the measuring section to measure the actual transit time of the initiated and reception-generated ultrasonic sound pulses. Transit time measurements for a single pass of initiated and return pulses are to be accurate to within 300 pico-seconds for a loop time.

Multiple measurements are sampled at a minimum of 1 second intervals of these transit time loops that are made to significantly improve accuracy over a single pass transit time measurements as employed in typical AWWA C750 ultrasonic meters to achieve low flow rate measuring accuracy.

Ultrasonic meters using single directional sound transmission to determine flow measurements are not acceptable. Meters that use measurement principals based on Faraday's Law are not permitted.

6A. SIGNAL OUTPUTS

The meter shall have 3 optional outputs – Analog, Dual Digital pulse output, or encoder output.

The Analog Output is a 4 – 20 mA current loop (the end user must supply power to the unit). 4 mA is always the set as the lower flow cutoff and the 20 mA output corresponds to the Max Flow Rate of the meter.

The Digital (pulse) Output is to be an open collector (open drain) transistor output that provides pulse per quantity with these options:

1. Two scaled forward flow pulses.
2. One scaled pulse forward flow and one flow direction.
3. One scaled forward flow pulse and one scaled reverse flow pulse.

The Encoder Output is to be serial communication collector utilizing UI1203 or UI1204 communication protocol.

The [Click **here** and type Name of Utility] shall choose one of these three basic output choices with dependent options on the Digital pulse option.

7. INSTALLATION REQUIREMENTS

Meters shall be designed so that no strainer or straightening vanes are required. There shall be no internal parts blocking the waterway. No straight runs of pipe shall be necessary before or after the meter.

8. ACCURACY AND HEAD LOSS TESTS

Meters shall EXCEED current AWWA C-702 test flow, head loss and accuracy standards as follows.

SIZE	SAFE MAXIMUM FLOW RATE	C-750 FLOW RANGE ACCURACY ± 0.5 %	NORMAL FLOW RANGE ACCURACY ± 1.5 %	EXTENDED LOW FLOW RANGE ACCURACY ± 5 %	HEAD LOSS @ SAFE MAXIMUM	LOW FLOW SENSITIVITY
2"	250 GPM	4- 200 GPM	1/2 GPM - 250 GPM	0.25 GPM	1.3 PSI	1/16 GPM
3"	500 GPM	5 – 350 GPM	1 GPM - 500 GPM	0.50 GPM	2.4 PSI	1/16 GPM
4"	1,000 GPM	15 – 700 GPM	1 1/2 GPM - 1,000 GPM	0.75 GPM	3.7 PSI	1/16 GPM
6"	1,600 GPM	20 – 1,150 GPM	3 GPM - 1,600 GPM	2 GPM	0.7 PSI	3/4 GPM
8"	2,800 GPM	50 – 2,000 GPM	5 GPM - 2,800 GPM	4 GPM	1.9 PSI	3/4 GPM
10"	5,500 GPM	90 – 4,400 GPM	14 GPM - 5,500 GPM	9 GPM	2.9 PSI	4 GPM

9. PRESSURE CAPABILITY

Meters shall operate up to a working pressure of one hundred seventy five (175) pounds per square inch (PSI) and to a temperature of 122 degrees Fahrenheit, without leakage or damage to any parts. The accuracy shall not be affected when operating at this pressure to possible distortion.

10. ACCEPTABLE METERS

In the interest of standardization, the following meter lines are acceptable to the [Click here and type Name of Utility] provided they fully comply with the above specifications and meet all requirements in the bid package:

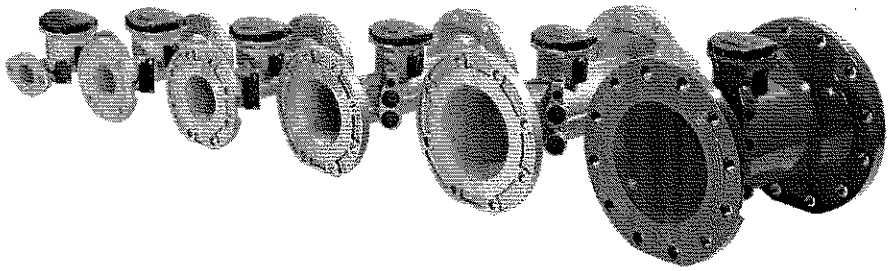
1. MASTER METER OCTAVE
2. APPROVED EQUAL

All meter models above shall be at a minimum ultrasonic type with at least two transit time paths. All meters not listed above shall pre-qualify. In order to pre-qualify, the manufacturer shall send necessary drawings and technical data to the [Click here and type Name of Utility] and complete a minimum of six-months in field testing. Any exceptions to the specifications shall be pre-qualified by the above method.

11. BIDDERS RESPONSIBILITY TO THIS SPECIFICATION

It is the responsibility of each bidder to carefully examine these specifications and the bid documents and become familiar with the requirements set forth herein. In addition, it is the responsibility of each bidder to submit all necessary information concerning their product to the [Click here and type Name of Utility]. Failure to do so could result in your bid being declared as non-responsive.

OCTAVE® ULTRASONIC METER



Octave brings the latest in ultrasonic metering technology to Commercial/ Industrial (C&I) water meters and puts precise measurement where the real flows exist. An excellent alternative to mechanical compound, single-jet, floating ball, and turbine meters, Octave excels at maintaining sustained accuracy for the life of the meter while providing smart AMR capabilities.

Technical Specifications:

Working Pressure – 175 PSI

Liquid Temperature – 32° - 122 °F

Metrological Characteristics – Meets AWWA Standard C-750-03, ISO 4064 rev. 2005

Configuration – Compact- Display built into unit

Power Source – 2 x D Size Lithium Thionyl Chloride batteries - 10 year warranted life time

Environmental Protection – NEMA 6P+ (IP68+), Ambient operation temp. -13 °F / +131 °F for the display

Display Units – Multi line 9 digit LC (Programmable USG, Cu Ft, M^3, Acre Feet for volume with GPM or metric flow rate choices)

Output – Programmable single/dual open collector pulse output, encoder OR Externally Powered loop 4-20 mA

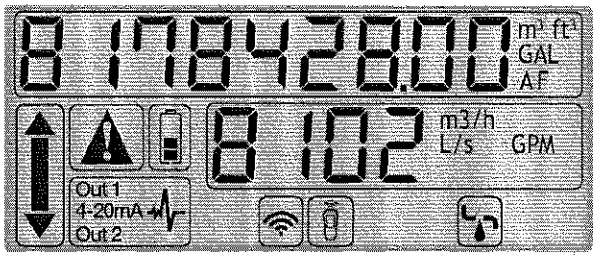
Features & Benefits:

- Flow sensitivity starting at 1/16 GPM
- Grade 316 Stainless Steel* or Epoxy Coated Ductile Iron body design provides full compliance with ANSI/NSF 372 (AB1953 or NSF61G)
- No moving parts. Minimal flow intrusion. Enduring accuracy.
- No required strainer
- Double beam ultrasonic measurement sensors for high accuracy and reliable operation
- FM Approval on all sizes
- Industry standard communication protocol for integration with most third-party AMR/AMI systems
- Active leak, theft, backflow, meter damage/tamper, rate of flow, and battery life indication
- Detailed LCD display features immediate reporting and visual indicators for 8 critical conditions
- Open collector pulse output, encoder or externally powered loop 4-20 mA
- Lithium battery provides guaranteed 10 year life expectancy
- Ruggedized NEMA 6P/IP-68+ construction; Fully submersible design
- Designed to meet standards for both North American and international C&I water meters

Features & Benefits:

- **Ultrasonic Measurement** — Unlike compound, single-jet, floating ball, and turbine meters that operate with mechanical measuring elements placed within the water flow, Octave — an ultrasonic meter — boasts no moving parts to ensure lifetime accuracy. Octave uses double beam ultrasonic measurement sensors to measure water flowing through the meter's throat without physically disrupting the flow.
- **Unique "Sing Around" Technology** — Signals are further processed using a proprietary processing method called "sing-around". In essence, instead of attempting to detect and process all instantaneous time of flight loops, using the "sing-around" method, the send / reflected time signals are sampled for "N" loops back & forth and that time is then measured. The average flow rate is then computed as that total time divided by N and thus significantly improving the measurement precision.
- **3G Technology Compatible** — Perfect for use with our 3G Mobile™ AMR and FixedLinx™ AMI technologies when connected to our 3G XTR™ endpoint. Alternatively, realize easy remote access to consumption data, alarms and alerts delivered daily via email, FTP or web-based access when connected to a 3G Cellular™ unit.
- **3G DataLogs™** — Scalable 4,000 point Data Logging Capabilities down to the minute (customer defined resolution) for meter right-sizing or to address high billing complaints.
- **Revenue Impact Alerts™** — Vigilant 24/7 protection against Leak, Tamper, Theft (backflow), and Zero Consumption.
- **3G SynchReads™** — Dual real-time clock for precise unnaccounted for water analytics and system balancing.
- **3G LeakZones™** — Ready to Deploy District Metering Areas or Zones (DMA/DMZ) Advanced Infrastructure Leak

Octave LCD Display



m³ GAL FT³ AF
VOLUME UNITS

L/s m3/h GPM
FLOW RATE UNITS

LEAK DETECTOR

BATTERY LEVEL ICON

FLOW DIRECTION ICON

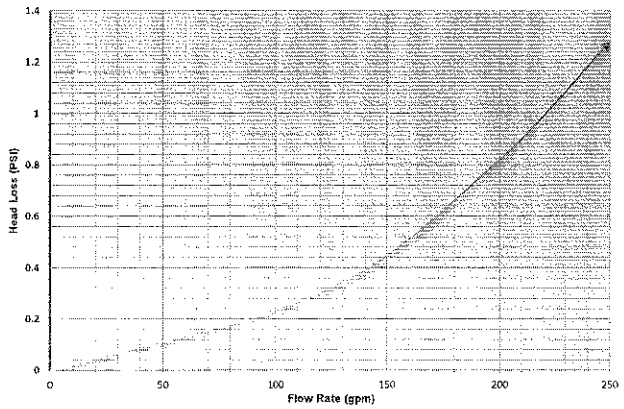
ALARM/MEASUREMENT ERROR ICON

4-20mA Out 1 Out 2
OUTPUT MODE

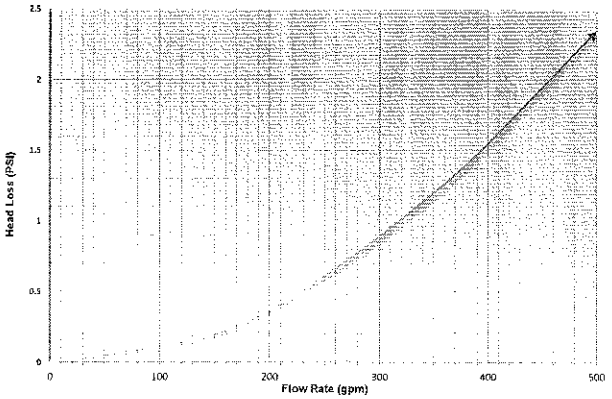
3G/GSM ACTIVE COMMUNICATION

Head Loss Charts

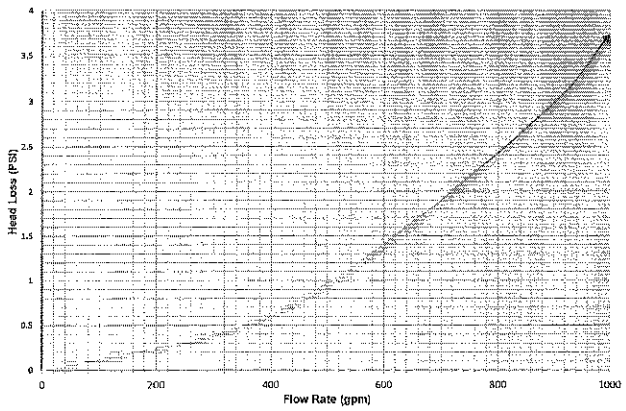
2" OCTAVE
Head Loss Performance Chart



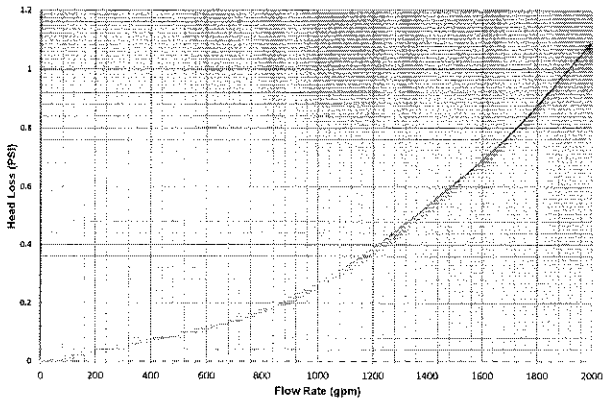
3" OCTAVE
Head Loss Performance Chart



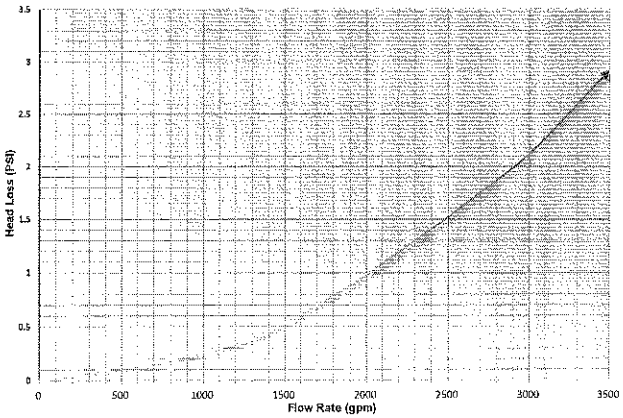
4" OCTAVE
Head Loss Performance Chart



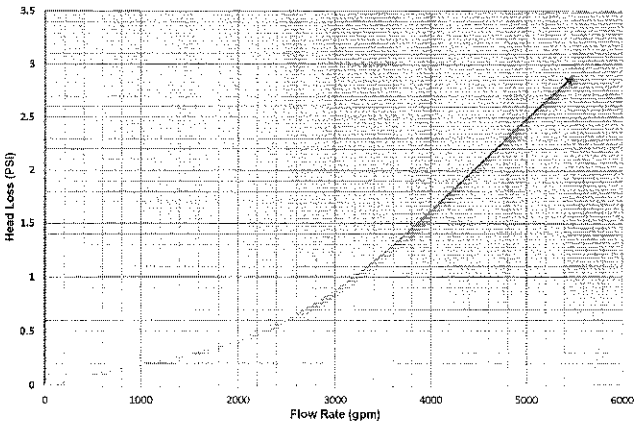
6" OCTAVE
Head Loss Performance Chart



8" OCTAVE
Head Loss Performance Chart



10" OCTAVE
Head Loss Performance Chart



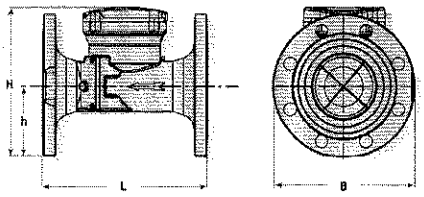
Accuracy Performance Data

Octave Nominal Size inch (mm)	Octave Starting Flow GPM (Lt/s)	Extended Low Flow @ +/- 5% GPM (Lt/s)	Normal Flow Range @ +/- 1.5% GPM (Lt/s)	Enhanced Flow Range @ +/- 0.5% GPM (Lt/s)	** Continuous Safe Max Flow GPM (Lt/s)
2" (50mm)	1/16 (.004)	1/4 (.016)	1/2 - 250 (.032 - 15.77)	4 - 200 (.25 - 12.62)	250 (15.77)
3" (80 mm)	1/16 (.004)	1/2 (.032)	1 - 500 (.06 - 31.54)	5 - 350 (.32 - 22.08)	500 (31.54)
4" (100 mm)	1/16 (.004)	3/4 (.047)	1-1/2 - 1,000 (.09 - 63.09)	15 - 700 (.94 - 44.16)	1000 (63.09)
6" (150 mm)	3/4 (.047)	2 (.13)	3 - 1,600 (.19 - 100.94)	20 - 1,150 (1.26 - 72.55)	1,600 (100.94)
8" (200 mm)	3/4 (.047)	4 (.25)	5 - 2,800 (.32 - 176.65)	50 - 2,000 (3.15 - 126.18)	2,800 (176.65)
10" (250 mm)	4 (.25)	9 (.57)	14 - 5,500 (.88 - 346.99)	90 - 4,400 (5.67 - 277.59)	5,500 (346.99)

** Continuous Safe Max Flow ranges listed for the Octave are for accurate flow measurement only and do not limit the Octave from meeting the Short-term Deluge Flow for fire services.

Dimensions

Model	Octave						
Nominal Size	2" SS (50 mm)	2" DI (50 mm)	3" (80 mm)	4" (100 mm)	6" (150 mm)	8" (200 mm)	10" (250 mm)
L - Length	10" (250 mm)	17" (432 mm)	12" (305 mm)	14" (356 mm)	18" (457 mm)	20" (508 mm)	18" (457 mm)
B - Width	5 3/4" (146 mm)	5 3/4" (146 mm)	7 1/2" (190 mm)	9" (229 mm)	11" (280 mm)	13 1/2" (343 mm)	16" (406 mm)
H - Height	6 3/4" (172 mm)	6 3/4" (172 mm)	8 1/2" (216 mm)	9 7/8" (250 mm)	10 7/8" (276 mm)	12 7/8" (327 mm)	15" (383 mm)
h - Height	2 1/8" (54 mm)	2 1/8" (54 mm)	3 1/2" (90 mm)	4 1/2" (115 mm)	5 1/8" (130 mm)	6 3/8" (162 mm)	7 3/4" (203 mm)
Weight - Ductile Iron	N/A	24 lbs. (11 kg)	36 lbs. (16 kg)	48.5 lbs. (22 kg)	76 lbs. (34 kg)	108 lbs. (49 kg)	150 lbs. (68 kg)
Weight - Stainless Steel	15 lbs (7 kg)	N/A	28 lbs (13 kg)	40 lbs. (18 kg)	62 lbs. (28 kg)	88 lbs. (40 kg)	N/A



Electrical Output Resolution Quantity/Pulse

	M^3	USG	Cu Ft.	A.F.
Resolution	Max Pulse width [ms]	Max Pulse width [ms]	Max Pulse width [ms]	Max Pulse width [ms]
0.0001	1			
0.001	10			125
0.01	90		3	125
0.1	125	4	32	125
1	125	40	125	125
10	125	125	125	125
100	125	125	125	125
1000	125	125		

Neal Farmer

National Sales Manager

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Email: nfarmer@mastermeter.com

* Grade 316 Stainless Steel design in process of approval. Epoxy coated design approved for NSF and FM.